

## ABSTRACT OF THE DISCLOSURE

Direct slicing of CAD models to generate process planning instructions for solid freeform fabrication may overcome inherent disadvantages of using STL format in terms of the process accuracy, ease of file management, and incorporation of multiple materials. This paper will present the results of our development of a direct slicing algorithm for layered freeform fabrication. The direct slicing algorithm was based on a neutral, international standard (ISO 10303) STEP-formatted NURBS geometric representation and is intended to be independent of any commercial CAD software. The following aspects of the development effort will be presented: 1) Determination of optimal build direction based upon STEP-based NURBS models; 2) Adaptive subdivision of NURBS data for geometric refinement; and 3) Ray-casting slice generation into sets of raster patterns. Feasibility studies applying the direct slicing algorithm to example models and the generation of fabrication planning instructions involving multi-material structures will also be presented.